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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/241,851	02/02/1999	TAKEHIKO NAKAI	865.4335	9228

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EXAMINER

CHANG, AUDREY Y

ART UNIT PAPER NUMBER

2872

DATE MAILED: 03/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/241,851

Applicant(s)

NAKAI, TAKEHIKO

Examiner

Audrey Y. Chang

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 October 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,5,9 and 11-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,5,9 and 11-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 27, 29.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on *October 8, 2002* has been entered.

2. This Office Action is also in response to applicant's amendment filed on October 8, 2002, which has been entered as paper number 28.

3. By this amendment, the applicant has amended claims 13, 18, 19 and has canceled claims 3, 6, 7 and 10.

4. Claims 1-2, 4-5, 9, and 11-22 remain pending in this application.

Information Disclosure Statement

5. The information disclosure statement filed on *October 8, 2002* fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in the English language. It has been placed in the application file, but the information referred to therein has **not** been considered.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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7. **Claims 18 and 19 are rejected under 35 U.S.C. 112, second paragraph**, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The phrase "each of the said pair of diffractive gratings comprises a flat surface" recited in claim 18 and the phrase "each of the said pair of diffractive gratings comprises a curved surface" recited in claim 19 are confusing and indefinite. It is not clear what are these flat surface and curved surface referred to. It is not clear if these surfaces are referred to the chamfered surfaces. If so, such should be explicitly stated. The applicant is respectively noted that claims 18 and 19 are dependent from claims 2, 4, 5, and 9 wherein **not** all of the independent claims have chamfered shape defined for **each** of the diffraction grating. One way to state such limitations may be "said chamfered shape comprises a flat surface (or a curved surface)" **with** the length or curvature specifics claimed follows the statement.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. **Claims 1, 11, 12, 13-17 and 20-22 are depended therefrom are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Ishii (PN. 6,157,488) in view of the patent issued to Gerritsen et al (PN. 5,048,925).**

Ishii teaches a diffractive optical element that is comprised of a pair of diffractive gratings (21, 22 in Figure 6, 201, 202 in Figure 8) that are formed at interface between a first and second optical regions (11, 12 in Figure 6 or 101, 102 in Figure 8) and at the interface between the second and a third

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optical regions (12, 13 in Figure 6 or 102, 103 in Figure 8), respectively. Ishii teaches that the different optical regions have *different refractive indices* and *different dispersion*, (please see column 13, lines 35-54). Ishii teaches that the diffractive optical element has the diffraction efficiency that is independent from the wavelength in the visible range and the diffraction efficiency achieves maximum value for a range of wavelengths within the visible range, (please see Figures 10 and 11). In fact, the first order diffraction efficiency becomes maximum for *at least two wavelengths* this implies that the maximum optical path difference is equal to the diffraction order ($m=1$) times the two wavelengths respectively, (please see Figure 10).

This reference has met all the limitations of the claims with the exception that it does not teach explicitly that the second optical region is a region with index refraction equal 1. However Ishii has taught the details and the equations for designing such diffractive optical element base on the *optical properties*, namely the refractive indices, dispersion and thickness, for each of the optical regions.

Gerritsen et al in the same field of endeavor also teaches that an air gap, which known in the art to have index refraction of 1 and low dispersion property, may be selected as intermediate medium between a pair of diffraction gratings, (please see Figure 6). It would then have been obvious to one skilled in the art to apply the teachings of Gerritsen et al in combination with the teachings of Ishii to choose air (with index of refraction of 1) as the second optical region, for the benefit of providing desired stacked diffraction operation, since it has been held when the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. Furthermore, air is demonstrated also a very well known optical material for the optical regions in the art and it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended used as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

With regard to claim 12, Ishii teaches that the diffractive gratings have blaze type relief patterns.

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With regard to claim 13, Ishii teaches that the diffractive optical element (41) may be used with a lens (51) within an image pick-up system (60), (please see Figure 22).

With regard to claims 15-16, Ishii teaches that the optical regions may include optical material such as ultraviolet curable resin, (please see column 13, line 40). Although this reference does not teach explicitly that each pair of the diffractive gratings are made of such resin however it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

With regard to claims 20-22, Ishii teaches the diffractive optical element is a diffractive lens that may assume conventional lens form (Figure 30) which means the diffractive optical element is formed on a lens.

10. Claims 2, 4, 5, 9 and 13-19 are dependent therefrom are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Ishii in view of the patent issued to Gerritsen and Sakai et al (PN. 5,279,924).

Ishii teaches a diffractive optical element that is comprised of a *pair of diffractive gratings* (21, 22 in Figure 6, 201, 202 in Figure 8) that are formed at interface between a first and second optical regions (11, 12 in Figure 6 or 101, 102 in Figure 8) and at the interface between the second and a third optical regions (12, 13 in Figure 6 or 102, 103 in Figure 8), respectively. Ishii teaches that the different optical regions have *different refractive indices* and *different dispersion*, (please see column 13, lines 35-54). Ishii teaches that the diffractive optical element has the diffraction efficiency that is independent from the wavelength in the visible range and the diffraction efficiency achieves maximum value for a range of wavelengths within the visible range, (please see Figures 10 and 11). In fact, the first order diffraction efficiency becomes maximum for at least two wavelengths this implies that the maximum

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optical path difference is equal to the diffraction order ($m=1$) times the two wavelengths respectively, (please see Figure 10).

This reference has met all the limitations of the claims with the exception that it does not teach explicitly that the second optical region is a region with index refraction equal 1. However Ishii has taught the *details* and the *equations* for *designing* such diffractive optical element base on the *optical properties*, namely the refractive indices, dispersion and thickness, for each of the optical regions.

Gerritsen et al in the same field of endeavor also teaches that an *air gap*, which known in the art to have index of refraction of 1 and low dispersion property, may be selected as intermediate medium between a pair of diffraction gratings, (please see Figure 6). It would then have been obvious to one skilled in the art to apply the teachings of Gerritsen et al in combination with the teachings of Ishii to make air (with index of refraction of 1) as the second optical region, for the benefit of providing desired stacked diffraction operation, since it has been held when the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. Furthermore, air is also demonstrated as a very well known optical material for the optical regions in the art and it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended used as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

These references also do not teach explicitly that the peak portions and/or the valley portions of the diffractive gratings are formed in a chamfered shape. Sakai et al in the same field of endeavor teaches a method for manufacturing optical diffractive grating wherein the optical diffractive grating are made to have serrated grating portion (13) (i.e. flat surface) at the peak of the grating and curved surface (20) at the valley of the grating, (please see Figures 2, 3(a) and 3(b)) for *improving* the diffraction efficiency of the diffractive grating. It would have been obvious to one having ordinary skill in the art to apply the

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teachings of Sakai et al to modify the diffractive optical element of Ishii to make the diffractive gratings having chamfered regions for the benefit of improving the diffraction efficiency.

With regard to claim 13, Ishii teaches that the diffractive optical element (41) may be used with a lens (51) within an image pick-up system (60), (please see Figure 22).

With regard to claims 15-16, Ishii teaches that the optical regions may include optical material such as ultraviolet curable resin, (please see column 13, line 40). Although this reference does not teach explicitly that each pair of the diffractive gratings are made of such resin however it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

With regard to claims 18 and 19, although these references do not teach explicitly about the claimed sizes for the flat surface of the serrated grating portion and the curvature of the curved surface of the grating however such modifications are considered to be obvious matter of design choices to one skilled in the art since it involves merely change in the size. A change in size is generally recognized as being within the level of ordinary skill in the art. In re Rose, 105 USPQ 237 (CCPA 1955).

Double Patenting

11. Applicant is advised that should claim 1 be found allowable, claim 11 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

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Response to Arguments

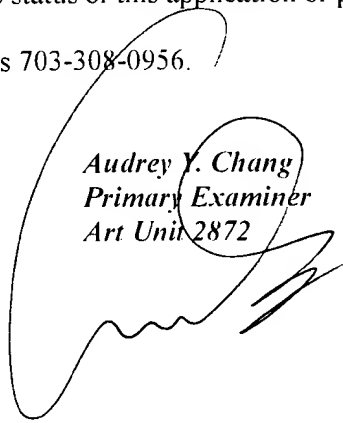
12. Applicant's arguments with respect to claims 1-2, 4-5, 9, and 11-22 have been considered but are moot in view of the new ground(s) of rejection.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 703-305-6208. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cassandra Spyrou can be reached on 703-308-1637. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

*Audrey Y. Chang
Primary Examiner
Art Unit 2872*



A. Chang, Ph.D.
March 7, 2003